



Original communication

Abdominal stab wounds: Self-inflicted wounds versus assault wounds

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ABSTRACT

Intentional penetrating wounds, self inflicted or inflicted by others, are increasingly common. As a result, it can be difficult for the forensic examiner to determine whether the cause is self-inflicted or not. This type of trauma has been studied from a psychological perspective and from a surgical perspective but the literature concerning the forensic perspective is poorer. The objective of this study was to compare the epidemiology of abdominal stab wounds so as to distinguish specific features of each type. This could help the forensic scientist to determine the manner of infliction of the wound.

We proposed a retrospective monocentric study that included all patients with an abdominal wound who were managed by the visceral surgery department at Angers University Hospital. Demographic criteria, patient history, circumstances and location of the wound were noted and compared. A comparison was drawn between group 1 (self inflicted wound) and group 2 (assault).

This study showed that the only significant differences are represented by the patient's prior history and the circumstances surrounding the wound, i.e. the scene and time of day. In our study, neither the site, nor the injuries sustained reveal significant clues as to the origin of the wound. According to our findings, in order to determine the cause, the forensic examiner should thus carefully study the circumstances and any associated injuries.

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1. Introduction

Intentional penetrating wounds to the abdomen, whether self-inflicted or inflicted by others, are increasingly common, and are becoming a real public health problem. It can sometimes be difficult for the forensic examiner to determine whether the cause is self-inflicted or physical assault. As such, stabbings have become a major cause of violent death, especially in France where firearms controls exist.¹ Around 59–61% of penetrating abdominal wounds are secondary to a blow made by a knife.^{2,3}

There are 30,000 suicides annually in the USA and 1,000,000 throughout the world.⁴ Suicide by stabbing represents 1.6–3% of all cases.^{5,6} Knives were used in 80.5% of self-inflicted penetrating wounds, and the abdomen was the target in 36% of cases.^{4,7}

Self-harm has already been studied from a psychological perspective,^{8,9} as has care for stab wounds to the abdomen from a surgical perspective^{7,10,11} so as to provide optimum surgical care.

The objective of this work was to compare the epidemiology of abdominal stab wounds inflicted by oneself, referred to as self-inflicted wounds and those inflicted by others, or assault. We aimed to study the domain and the associated injuries with a view to identifying any specific features that would allow the two ways in which wounds are inflicted to be distinguished, thus helping forensic examiners in their daily work.

2. Material and method

All patients receiving care for an intentional abdominal stab wound, regardless of the number of wounds, in the visceral surgery department at Angers University Hospital between 1 January 2001 and 1 January 2011 were included in this monocentric retrospective study.

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Patients with accidental or superficial stab wounds not receiving care from the visceral surgery department were not included in this work.

Demographic criteria (age, gender, date of wound), medical history, circumstances (time of day), scene, presence of alcohol intoxication, manner of trauma, number of wounds, weapon used, location of the wound, and medical care and/or forensic examination of the wound were noted retrospectively. Alcohol intoxication was considered present if blood concentration was found to be greater than 0.5 g/L.

Two groups were established according to patient history. Group 1 corresponded to patients who attempted suicide using a knife and Group 2 corresponded to those who had been assaulted.

Data was entered into a Microsoft Excel® spreadsheet, and statistics (Fisher exact test) were calculated using Epi Info 6®. A value of $p < 0.05$ was considered as significant.

3. Results

Twenty-four patients were treated for intentional abdominal stab wounds. In order to compare cause, we split the patients into two groups. Group 1 comprised 9 patients (37.5%) who attempted suicide using a knife. Group 2 comprised 15 patients (62.5%) who had been assaulted by one or more individuals armed with a knife.

Epidemiological data for these patients is given in Table 1. Seventeen patients were male (70.8%) and seven were female (29.2%). The average age was 35 (15; 77). Eight patients had prior psychiatric history (33.3%) of psychosis or depressive syndrome with or without a suicide attempt. Seven patients had prior history of chronic alcoholism (29.2%). At the time of the wound, 11 patients were intoxicated by alcohol (45.8%) and the average level of alcohol in these patients was 2.13 g/L (the lowest level being 1.1 g/L, and the highest 4.36 g/L).

In Group 1, 3 of the patients were female (33.3%) while 6 were men (66.7%). The average age was 37 (17; 58). Three patients were intoxicated by alcohol (33.3%) and the average alcohol level was 3.1 g/L. One patient was intoxicated by paracetamol at toxic doses (11.1%) without alcohol. Six patients had prior psychiatric histories (66.7%). Among them, one was psychotic (16.7%), 3 had depressive syndrome with no prior history of attempting suicide (50%) and 2 had a prior history of attempted suicide (33.3%). One of these patients was addicted to cocaine.

In Group 2, 4 of the patients were female (26.7%) while 11 were men (73.7%). The average age was 34 (15; 77). Eight patients were intoxicated by alcohol (53.3%) and the average alcohol level was 1.9 g/L. Only two patients had prior psychiatric histories (13.3%).

There was no significant difference as regards gender between the two groups ($p = 0.53$). Likewise, acute alcoholic intoxication did not represent a significant difference between the two groups ($p = 0.3$).

In Group 1, as shown in Table 2, the suicide attempt took place at the patient's home in 8 cases (88.9%) and at the victim's parents' home in one case (11.1%). The event took place between 8 a.m. and 9 p.m. in 6 cases (66.7%).

Table 1
Epidemiological data of intentional abdominal stab wounds.

	Group 1 <i>n</i> = 9	Group 2 <i>n</i> = 15	Total <i>n</i> = 24	<i>p</i>
Gender				
Male	6	11	17	0.53
Female	3	4	7	0.53
Average age	37	34	35	
Acute alcoholic intoxication	3	8	11	0.3
Prior psychiatric history	6	2	8	

Table 2

Scene, time of incident and weapon used according to the manner of infliction of the wound.

	Group 1 <i>n</i> = 9 (%)	Group 2 <i>n</i> = 15 (%)	Total <i>n</i> = 24	<i>p</i>
Scene				<0.005
Home	8 (88.9%)	2 (13.3%)	10	
Aggressor's home (group 2) or parents' home (group 1)	1 (11.1%)	2 (13.4%)	3	
Public place	0	11 (73.3%)	11	
Time				
9 P.M.–8 A.M	3 (33.3%)	14 (93.3%)	17	0.004
8 A.M.–9 P.M	6 (66.7%)	1 (6.7%)	7	0.003
Weapon				
Knife	8 (88.9%)	10 (66.7%)	18	
Screwdriver	0	1 (6.6%)	1	
Broken glass	0	1 (6.7%)	1	
Wood chisel	1 (11.1%)	0	1	
Unknown	0	3 (20%)	2	

The weapon used was a knife in 8 cases (88.9%) and a wood chisel in 1 case (11.1%). The subjects in this group did not consult the forensics department to have a medical certificate describing the injury drawn up.

When the wound was inflicted by someone else (Group 2), the attacker was alone in 9 cases (60%) and accompanied by others in 1 case (6.7%). In 5 cases (33.7%), the victim was unable to disclose the number of attackers. The attackers were unknown to the victim in 11 cases (73.3%). When the attacker was known, the situation was one of domestic violence (partner, ex-partner, former spouse of the current partner). The attack took place in public in 11 cases (73.3%), at the victim's home in 2 cases (13.3%) or at the partner's home in 2 cases (13.4%). In 14 cases (93.3%), the attack took place between 9 p.m. and 8 a.m. The weapon was a knife in 10 cases (66.7%), a screwdriver in 1 case (6.6%), a broken glass in 1 case (6.7%) and was not determined in 3 cases (20%). A forensic consultation was made in 11 cases (73.3%). When the forensic consultation occurred, the period of complete unfitness for work was 16 days on average (between 10 days and 1 month). Only one victim had a descriptive certificate made by the visceral surgery department, with the period of unfitness for work set at 4 days.

As shown in Table 2, there were significantly more wounds inflicted in public in Group 2 ($p < 0.005$) while more wounds were inflicted at home in Group 1 ($p < 0.005$). The wounds were inflicted significantly more often after 9 p.m. in Group 2 than in Group 1 ($p = 0.004$) while wounds were inflicted significantly more often after 8 a.m. in Group 1 ($p = 0.003$).

As regards care for the wound, an abdominal CT was carried out in 14 cases (56%). Six scans (42%) were performed in Group 1 and 8 scans were performed in Group 2 (58%). Simple monitoring was undertaken in 5 cases (20.8%), exploration by midline laparotomy

Table 3
Location of the wound according to the manner of infliction of the wound.

	Group 1 <i>n</i> = 9 (%)	Group 2 <i>n</i> = 15 (%)	Total <i>n</i> = 24	<i>p</i>
Epigastrium	1 (100)	0 (0)	1	0.4
Left hypochondrium	2 (40)	3 (60)	5	0.6
Right hypochondrium	0 (0)	1 (100)	1	0.58
Peri-umbilical	2 (40)	3 (60)	5	0.67
Left iliac fossa	0 (0)	1 (100)	1	0.58
Right flank	3 (75)	1 (25)	4	0.18
Left flank	0 (0)	4 (100)	4	0.12
Peri-umbilical, right flank	0 (0)	1 (100)	1	
Peri-umbilical, left hypochondrium	0 (0)	1 (100)	1	
Not given	1 (100)	0 (0)	1	

Table 4
Organ wound location according to the manner of infliction of the wound.

	Group 1 <i>n</i> = 9 (%)	Group 2 <i>n</i> = 15 (%) (17 organ wounds)	Total <i>n</i> = 24 (%) (26 organ wounds)
Aponeurosis	5	7	12
Colon	1	1	2
Liver	2	2	4
Epigastric pedicle	1	1	2
Stomach	0	2	2
Intestine	0	1	1
Omentum	0	1	1
Mesenteric artery	0	1	1
Diaphragm	0	1	1

or coelioscopy was performed in 14 cases (58.4%) and local exploration in 5 cases (20.8%).

Table 3 gives the location of wounds in each group. There was no significant difference in wound location according to group.

As can be seen in Table 4, in Group 1 an organ wound was found in 4 cases (44.4%) (liver, colon, epigastric pedicle) and no organ wound in 5 cases (53.6%). In Group 2, there were 8 patients that presented organ wounds (53.3%) (But 10 wounds – one patient presented 3 organ injuries) (Stomach, colon, intestine, liver, epigastric pedicle, mesenteric artery, omentum, diaphragm). There was no significant difference in the number of organ wounds in Group 1 or 2 ($p = 0.55$).

There were concomitant wounds in 6 cases (25%). In Group 1, only 1 case of an inconsequential concomitant wound was reported (5 wounds to the thorax), representing 11.1%. In Group 2, there were 5 concomitant wounds (to the upper limb, thorax, face and/or neck), representing 33.3%. In Group 2, when concomitant wounds were present, these were generally found on several linked sites and were more serious than in Group 1. In fact, we report a radial nerve wound, severance of a tendon at the finger, and a hemopneumothorax.

The number of concomitant wounds was not significantly higher in Group 2 than in Group 1 ($p = 0.23$).

Subsequent care was simple in 100% of cases.

4. Discussion

The typical population of patients attempting suicide by stabbing is male (in 81%) with an average age of 35 to 70.^{7,12–14} However, another study reports as many men as women.¹⁵ Between 12.3% and 41% of these patients had previously attempted suicide.^{12,13} In fact, a reoccurrence rate for attempted suicide is actually reported of 1.4% within the following year.⁷ Acute alcoholic intoxication is between 25 and 50%.^{7,12}

In our study, we observed in group 1 a majority of males (66.7%) under alcoholic intoxication (33.3%) with an average age of 35, and prior psychiatric history in 66.7% of cases. This data is in line with that found in the literature. The only difference between these two groups was the psychiatric history, which was significantly lower in group 2 (13.3%). This can be explained by the fact that victims of assault are “chosen” at random from the general population. However, patients attempting suicide have borderline personalities, for the most part. This type of personality is reported to be 11%–15% in the population.⁹ Around 10% of this population will attempt or has attempted suicide by stabbing.⁹

As regards the circumstances of the wound, suicide attempts occurred most often during the day, in the patient's own home, whereas assaults occurred more often at night in a public place.

In Group 1, the weapon used was essentially a knife (88.9%) as described in the literature. In Group 2, the weapon was also essentially a knife (66.7%).

The fact that the preferred weapon is a knife can be explained by its higher availability. The difference in circumstance of wounds can be explained by the fact that assaults occur generally at night, when the streets are less crowded and people are more intoxicated by alcohol as the night goes on. Suicide attempts occur more often during the day or at the end of the day, in a reassuring, more confined environment.

In the case of abdominal wounds, standard care consists of taking an abdominal scan if the victim's haemodynamic condition allows this.¹⁶ In the event of haemodynamic instability, emergency exploration by laparotomy in the operating theatre is carried out.

If a scan is performed, in the absence of pneumoperitoneum or hemoperitoneum, simple monitoring is carried out, otherwise an exploration by coelioscopy or laparotomy is undertaken.^{3,11}

Previous studies have found that most self-inflicted abdominal wounds occur to the right side of the abdomen (40% in the upper part, and 23% in the lower part).¹² The fact that the wound is located on the right was explained by the fact that most people are right-handed and this phenomenon provides explanation for why it may be more difficult for most people to self-harm on the left-hand side.¹² Through our work, we did not encounter a typical location for self-inflicted wounds. However, it would seem that the impact is borne more by the upper part of the abdomen (hypochondrium, epigastrium or upper part of the right flank). This can be explained by the fact that those attempting suicide seek to reach the heart. Our study also found that the wound's site does not vary according to the way in which the wound was sustained.

In the event of a self-inflicted abdominal wound, other researchers have identified organ injury in about 60–66% of cases.¹² We found organ wounds in 44.4% of cases in Group 1. In Group 2, an organ wound was found in 53.3% of cases, showing no significant variation from Group 1. We reported wounds to the colon, liver, stomach, intestine and epigastric pedicle.

In the case of a self-inflicted abdominal wound, wounds are reported to the diaphragm, the stomach, the small intestine, the colon, or the rectum, the pancreas, the liver, the spleen or the abdominal vessels.^{7,12} Self-inflicted wounds were reported to provide organ wounds in 43.5% of cases.¹² A heart wound was even reported.¹⁷

Other elements not directly concerning our research topic were explored in order to distinguish between the two causes of abdominal wounds we have identified. In terms of suicide attempts via stabbing, several wounds were described, including “hesitant wounds”, or defensive wounds,²¹ and those where there was an absence of damage to clothing.¹⁸ Hesitant wounds have been found to be present in 70% of cases¹⁸ and clothing damage in 4.5–28.6% of cases.^{18–20} In our study, which covers only abdominal wounds, we did not observe any hesitant wounds. No clothing damage was found in our study, probably because this information was not reported in the medical observations. We only found one case of concomitant wounds to the thorax (11.1%). In comparison, Abdullah et al. reported an average of 1.5 wounds during self-inflicted acts using knives to the abdomen.¹²

Racette et al. reported hesitant wounds depending on the wound context in 74% of suicides and 61% of assaults respectively.²¹ These injuries seemed to discriminate only according to the location.²¹ In contrast, a recent study reported that wounds in the context of an assault were linked to other wounds, whereas the self-inflicted wound was often a single one.¹ Di Nunno et al. reported the presence of trial wounds as suggestive of suicide.²³ Our work did not report the direction of the wounds because of the retrospective character of the study and the absence of this information in the observations but Di Nunno et al. also noted a difference in this criterion: a horizontal axis for the wound seems to be linked more with suicide, while a vertical wound seems to be linked more to assault.^{1,22}

5. Conclusion

It can sometimes be difficult for the forensic examiner to distinguish between self-inflicted or assault wounds to the abdomen. This study shows that the only significant differences are represented by the patient's prior history and the circumstances of the wound (scene of incident and time of day). Neither the location, nor the organs injured reveal significant differences which may provide clues as to the origin of the wound. In order to determine cause, the forensic examiner should thus carefully study the circumstances and any related injuries.

We propose that the results of this study be corroborated with prospective studies with a larger sample sizes.

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Conflict of interest

None.

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